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SERUM PROFILE OF BROILERS BY DIETARY SUPPLEMENTATION WITH SELENIUM, ZINC AND VITAMIN E*

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Introduction

Now-a-days, broiler birds are selectively bred and reared for faster growth rate which makes them highly susceptible to oxidative changes in the muscle tissue. In addition the broiler birds are subjected to immunological challenge. In a similar way, in living birds, oxidative stress constitutes an important mechanism that leads to biological damage, and is regarded as one of the causes of several pathologies that affect poultry growth. Vitamin E is a chain breaking antioxidant that protects the tissue from oxidative damage. Selenium is an essential trace element that plays an important role in antioxidative system efficiency as a component of selenium dependent glutathione peroxidase (Yoon *et al.* 2007). Free radicals are scavenged by vitamin E as a first line of defense and glutathione peroxidase of which selenium is a part, destroys any peroxides formed before they can damage the cell. Further more, the deficiencies of vitamin E or selenium or both impair the immune function in young chicks (Swain *et al.* 2000), and inclusion of dietary α-tocopherol or selenium or both retards oxidative processes and microbial growth in poultry meat (Kim *et al.* 2010). Zinc is an essential trace element that plays an important role in various biological activities like immunity and oxidative stability. Therefore, a biological experiment was conducted to study the serum profile of broilers by dietary supplementation with selenium, zinc and vitamin E.

Materials and Methods

A biological study was conducted with two hundred sex-separated day-old, commercial broiler (Vencobb) chicks belonging to single hatch. These chicks were wing banded, weighed and randomly allotted into five treatment groups with four replicates of ten chicks each. All

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chicks were reared up to 6 weeks in deep litter system in open sided broiler house under standard managemental conditions throughout the experimental period. The treatment groups consisted of basal diet T_1 (0.25 mg selenium, 80 mg zinc and 50 mg vitamin E), T_2 (basal diet + 0.25 mg selenium, 80 mg zinc and 50 mg vitamin E), T_3 (basal diet + 0.50 mg selenium, 160 mg zinc and 100 mg vitamin E), T_4 (basal diet + 0.75 mg selenium, 240 mg zinc and 150 mg vitamin E) and T_5 (basal diet + 1.00 mg selenium, 320 mg zinc and 200 mg vitamin E). The experimental feed was formulated according to the Vencobb standards by supplementing selenium, zinc and vitamin E at different levels. All the diets were isocaloric and isonitrogenous.

At the end of the experiment (42^{nd} day), four males and four females, totally eight birds per treatment group were randomly picked up, blood samples were collected for measuring the serum biochemical parameters and slaughtered. Blood samples were allowed to clot and centrifuged for 20 min at 1500 rpm to separate the sera. The sera samples were stored at -20^{o}C for the analysis of serum cholesterol and serum triglycerides as per the one step method of Wybenga *et al*. (1970) and Enzymatic (Glycerol - 3 - Phosphate oxidase / Trinder), single Reagent chemistry with LCF (Lipid Clearing Factor), respectively.

Results and Discussion

Statistical analysis of data on serum total cholesterol ($P < 0.05$) and HDL cholesterol ($P < 0.01$) revealed significant difference between treatment groups. The T_1 group recorded the highest serum total cholesterol (90.62 mg/dl), HDL cholesterol (53.77 mg / dl). Whereas, the LDL cholesterol did not differ significantly between treatment groups.

The serum triglycerides revealed significant difference ($P < 0.01$) among treatment groups with highest triglyceride value in T_1 group (64.28 mg/dl) and the lowest value in T_4 group (25.71 mg/dl). This results were in accordance with the findings of Sahin *et al.* (2002) and Hosseini-Mansoub *et al*. (2010) who concluded that when the diet enriched with vitamin E (100 mg/kg) and zinc (50 mg/kg), then the blood measures of cholesterol, triglyceride and glucose levels significantly decreased compared to unsupplemented group.

This could be due to the antioxidant action of enriched diet with selenium, zinc and vitamin E resulting in less production of MDA in the liver by increase in the amount of glutathione peroxidase enzyme that protects the bird from oxidative damage and thereby serves to reduce the serum concentration of total cholesterol, triglycerides and LDL cholesterol.

Summary

This study suggested that the supplementation of selenium, zinc and vitamin E in broiler diets at the level of basal diet + 0.75 mg selenium, 240 mg zinc and 150 mg vitamin E (T_4 group) reduced the serum triglycerides level.

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Table

Mean (± S. E.) serum total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides level (mg / dl) of broilers at 6 weeks of age as influenced by dietary supplementation of selenium, zinc and vitamin E

Treatment groups	Total cholesterol	HDL cholesterol	LDL cholesterol	Triglycerides
T_1 - Basal diet (0.25 mg Selenium, 80 mg Zinc and 50 mg vitamin E)	$90.62^{a} \pm 2.01$	$53.77^{A} \pm 1.19$	23.98 ± 2.57	$64.28^{A} \pm 3.37$
T_2 - Basal diet + (0.25 mg Selenium, 80 mg Zinc and 50 mg vitamin E)	$88.39^{ab} \pm 2.76$	$44.91^{B} \pm 0.69$	31.33 ± 3.83	$60.71^{A} \pm 4.94$
T_3 - Basal diet + (0.50 mg Selenium, 160 mg Zinc and 100 mg vitamin E)	$75.00^{bc} \pm 4.86$	$42.15^{BC} \pm 1.15$	24.56 ± 5.01	$41.42^{B} \pm 5.48$
T_4 - Basal diet + (0.75 mg Selenium, 240 mg Zinc and 150 mg vitamin E)	$75.44^{abc} \pm 6.93$	$37.64^{CD} \pm 0.43$	32.65 ± 7.06	$25.71^{C} \pm 1.87$
T_5 - Basal diet + (1.00 mg Selenium, 320 mg Zinc and 200 mg vitamin E)	$66.96^{c} \pm 7.59$	$36.48^{C} \pm 1.90$	25.19 ± 6.54	$26.42^{BC} \pm 3.22$

Value given in each cell is the mean of eight observations

$^{A-C}$ Means within a column with no common superscript differ significantly ($P < 0.01$)

$^{a-c}$ Means within a column with no common superscript differ significantly ($P < 0.05$)

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